Chief Medical Officer of Health's Report on the Management of the 2008 Listeriosis Outbreak in Ontario

April 2009

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Introduction

A listeriosis outbreak that began in the summer of 2008 affected people in seven provinces across Canada. By December, when the outbreak was declared over, 56 confirmed cases had been reported and at least 21 people had died.

Of all the provinces, Ontario was the hardest hit. Forty-one of the cases and 16[1] of the deaths were in Ontario. Most of the Ontarians who fell ill were elderly (mean age: 78), and 88% were either living in a long-term care home or hospitalized before they became ill.

The outbreak was first detected in Ontario. The source of *Listeria monocytogenes* – the bacteria that caused the outbreak – was two production lines at a Maple Leaf Foods packaging plant in the province. The Public Health Division of the Ministry of Health and Long-Term Care (MOHLTC) took the lead in investigating and managing the outbreak in the province.

The MOHLTC is committed to continually enhancing its capacity to protect the public from outbreaks. As part of that commitment, the Chief Medical Officer of Health established the Provincial Listeriosis Outbreak Review Committee to review the way the public health system responded to the outbreak, identify strengths and weaknesses, and make recommendations to improve the management of outbreaks caused by foodborne illnesses. What did we do well? What can we do better? This report is a summary of the Chief Medical Officer of Health's assessment of the management of the 2008 listeriosis outbreak.

[1] By December 8, 2008, when the outbreak was declared over, public health units in Ontario had reported 15 deaths where listeriosis was an underlying or contributing factor. Since that time, listeriosis was identified as a contributing factor in one other death among the 41 confirmed cases in Ontario, bringing the total number of deaths in the province related to the outbreak to 16.

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Background

To assess the strengths and weaknesses of Ontario's response to the 2008 listeriosis outbreak, it's important to understand the challenges associated with detecting and managing foodborne outbreaks.

1. Foodborne illnesses are common and outbreaks are difficult to detect

Foodborne illnesses caused by microorganisms such as *Listeria*, *Salmonella* and *E. coli* are widespread. Foodborne outbreaks often either go undetected or their source remains unknown because:

- Cases of foodborne illnesses are vastly under-reported to public health.
- Foodborne illnesses often don't cause severe illness or deaths.
- People who are ill or elderly – two groups most vulnerable to foodborne illnesses – often have other health conditions, so their illnesses or deaths may not be linked to food.
- It takes time for symptoms to develop, so when foodborne outbreaks are detected, it may not be possible to conclusively identify the source food.

2. The source of listeriosis outbreaks are particularly difficult to identify

Listeriosis is a reportable disease in Ontario as designated by Ontario Regulation 559/91 (Specification of Reportable Diseases) under the *Health Protection and Promotion Act* (HPPA).

Listeria monocytogenes – the bacteria that cause listerosis – are widespread in the environment. *Listeria* can be found in soil, water, mud, forage and silage. Listeriosis is rare compared to many other foodborne illnesses. Before 2008, Ontario typically saw about 40 cases of listeriosis – with between one and three deaths – each year. Sporadic cases of listeriosis are usually caused by foods contaminated during handling. Outbreaks have been traced to raw or contaminated milk and milk products, raw vegetables and ready-to-eat meats. Because foods can be contaminated when they are processed and packaged or at any time after, it is often difficult to identify the source of the contamination. *Listeria* is an unusual type of bacteria in that its growth is not slowed by refrigeration.

The sources of the *Listeria* contamination that cause outbreaks are particularly difficult to identify because of the nature of the *Listeria* bacteria, the non-specific symptoms of listeriosis and the long incubation period.

Eating food contaminated with *Listeria* does not always lead to illness. People who are healthy may experience no symptoms or only a mild illness. Most people who do become ill develop non-specific symptoms that resemble other gastrointestinal or flu-like illnesses, such as vomiting, diarrhea, headache and fever. These symptoms usually last for three or four days; and then people recover.

People who are particularly susceptible, such as elderly people, people who are immuno-compromised, infants and pregnant women, can develop a more severe form of listeriosis that can cause conditions such as meningitis, encephalitis, septicaemia and stillbirth. Diagnosing listeriosis requires laboratory testing to isolate the bacteria in samples of blood or cerebrospinal fluid.

Even in an environment where there are many people susceptible to listeriosis, such as a long-term care home, very few may become ill from eating food contaminated with *Listeria*. The fact that so few people fall ill makes it more difficult to detect outbreaks of listeriosis.

Listeriosis has a long incubation period. It can take three to 70 days after eating food contaminated with *Listeria* before people develop symptoms. In most cases, it takes three to four weeks for symptoms of listeriosis to develop – by which time the people who are ill may no longer remember what or where they ate, and/or the possible food source may no longer be available for testing.

3. Laboratory testing for *Listeria* takes time

As noted above, the only way to confirm listeriosis is through laboratory testing, and that takes time.

Testing people

Identifying the bacteria in people with symptoms of listeriosis requires a microbiological culture from a sterile site. This testing is performed routinely by hospital and private laboratories. Final results of these cultures, which are required for patient care, are available in seven to ten working days.

When hospital and private laboratories have a bacterial culture that yields *Listeria monocytogenes*, they often forward it to the Ontario Central Public Health Laboratory for confirmatory testing. At the time of the outbreak, the Ontario Central Public Health Laboratory referred confirmed cultures to the National Microbiology Laboratory in Winnipeg for "fingerprinting." Fingerprinting or molecular typing is used to determine whether different cases of listeriosis are caused by the same strain of bacteria and, therefore, might be part of an outbreak rather than separate sporadic cases.

Fingerprinting of human samples is done at the National Microbiology Laboratory in Winnipeg using Pulsed-Field Gel Electrophoresis. The protocol for fingerprinting or molecular typing typically takes seven *working* days. This means that complete laboratory testing of human samples – including culture and molecular typing – takes 14 to 17 days.

Testing food

Identifying the bacteria in food also requires a microbiological culture and "fingerprinting" or molecular typing. To find the source of the *Listeria* contamination in food, all food suspected of being related to the listeriosis cases were submitted to the Central Public Health Laboratory, which forwarded them to the *Listeria* Reference Laboratory for culture and molecular testing. From August 13 onwards, when the Canadian Food Inspection Agency (CFIA) requested samples of unopened food samples, all food samples were submitted directly to the CFIA laboratory in Toronto.

The process of testing food samples – that is, culture testing and molecular typing – typically takes 14 to 15 working days. During the 2008 outbreak, it took 14 days from the time the first food sample was submitted (July 21) until the results were available (August 4).

Comparing human and food test results

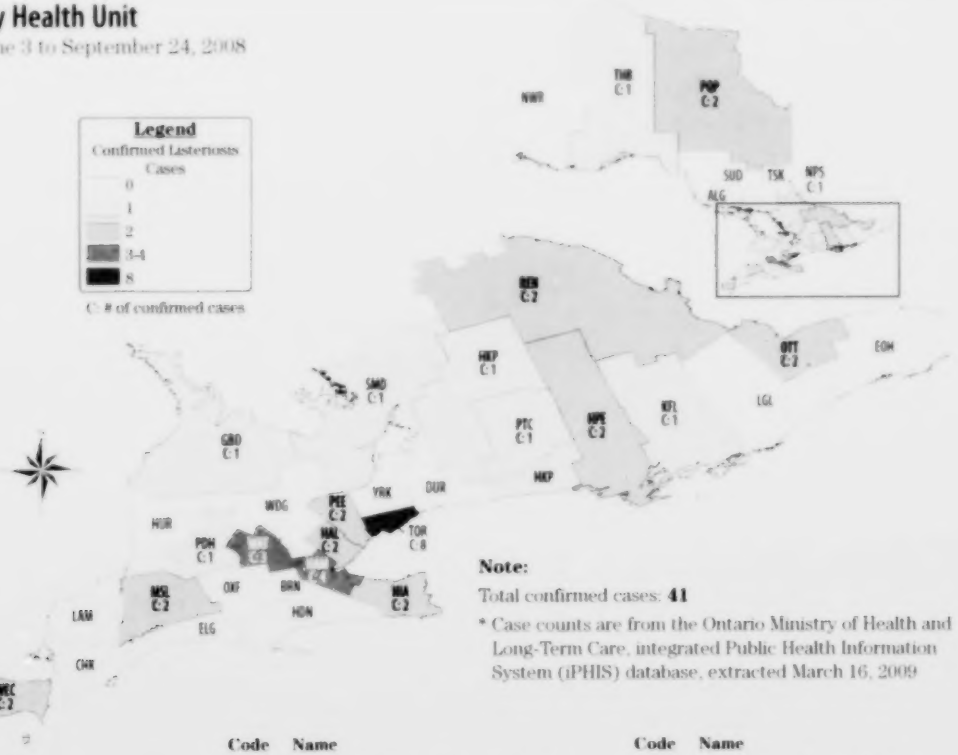
Results of the molecular typing from food samples are then sent to the National Microbiology Laboratory in Winnipeg to compare with the results from human samples. By matching strains of *Listeria*, the laboratory can support the link between clinical cases of listeriosis and epidemiologically linked food sources.

4. Large-scale manufacturing, processing and distribution of food make it more difficult to detect the source of foodborne outbreaks

Foodborne outbreaks are easier to detect and manage when they are localized – that is, when they affect a number of people within a geographic area and when the source of the contaminated food is local. With large-scale food manufacturing, foods are now processed and packaged in a small number of large plants and then shipped hundreds – sometimes thousands – of miles either to be sold as a packaged product or made into other products, which are then sold. Cases of illness caused by a contaminated product may occur in hundreds of different locations and may never be linked to the same cause or source. For example, the two lines that were contaminated in the Maple Leaf plant produced products that were shipped across Canada and marketed under more than 200 different brand names or labels – making both detecting the problem and managing a food recall extremely complex. During the 2008 listeriosis outbreak, confirmed cases occurred in seven different provinces and in 20 different health units in Ontario.

Listeriosis Cases by Health Unit

Case Onset Dates: June 3 to September 24, 2008



Note:

Total confirmed cases: **41**

* Case counts are from the Ontario Ministry of Health and Long-Term Care, integrated Public Health Information System (iPHIS) database, extracted March 16, 2009

Health Unit

Code	Name
ALG	Algoma District
BRN	Brant County
CHK	Chatham-Kent
DUR	Durham Regional
ELG	Elgin-St. Thomas
EOH	Eastern Ontario
GBO	Grey Bruce
HAL	Halton Regional
HAM	City of Hamilton
HDN	Haldimand-Norfolk
HKP	Haliburton-Kawartha-Pine Ridge District
HPE	Hastings and Prince Edward Counties
HUR	Huron County
KFL	Kingston-Frontenac and Lennox and Addington
LAM	Lambton
LGL	Leeds-Grenville and Lanark District
MSL	Middlesex-London
NIA	Niagara Regional Area
NPS	North Bay Parry Sound District
NWR	Northwestern
OTT	City of Ottawa
OXF	Oxford County
PDH	Perth District
PEE	Peel Regional
PQP	Porcupine
PTC	Peterborough County-City
REN	Renfrew County and District
SMD	Simcoe Muskoka District
SUD	Sudbury and District
THB	Thunder Bay District
TOR	City of Toronto
TSK	Timiskaming
WAT	Waterloo
WDG	Wellington-Dufferin-Guelph
WEC	Windsor-Essex County
YRK	York Regional

Given the evolving trend to large-scale food processing, non-localized outbreaks are likely to become more common, and it may be increasingly difficult for public health officials to pinpoint the specific source of outbreaks. When they do, their ability to manage the outbreak can be complicated by jurisdictional issues.

In the case of the listeriosis outbreak, provincial public health authorities were leading the provincial investigation, but a federal agency – the Canadian Food Inspection Agency – was responsible for regulating and inspecting the meat packaging plant that was the source of the contamination. Because the local and provincial public health officials were not directly involved in inspecting the plant, it was difficult for them to obtain information about its production processes and the extent to which contaminated products had been distributed across the province.

5. Cross-jurisdictional outbreaks involve many partners

An outbreak that crosses jurisdictions involves many partners. The 2008 listeriosis outbreak involved almost 50 local, provincial and federal partners, including:

- 36 public health units
- Public Health Division as well as other areas of the Ontario Ministry of Health and Long-Term Care (MOHLTC)
- Ontario Public Health Laboratories
- Ontario Agency for Health Protection and Promotion (OAHPP)
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
- Health Canada – particularly the *Listeria* Reference Laboratory in Ottawa
- Public Health Agency of Canada (PHAC)– including the National Microbiology Laboratory in Winnipeg
- Canadian Food Inspection Agency.

Coordination among so many partners can be challenging, particularly if the roles and responsibilities are not clear.

6. Different levels of evidence are required for different purposes during an outbreak

Because of their different mandates, the agencies involved in a cross-jurisdictional outbreak (e.g., CFIA, MOHLTC, public health units) may require different levels of evidence, use different sampling techniques, and have different criteria/standards to trigger warnings, alerts and product recalls.

The CFIA is the regulatory agency in Canada with the authority to issue a mandatory food recall. However, the Ontario *Health Protection and Promotion Act* gives local medical officers of health, local boards of health and, under certain conditions, the Chief Medical Officer of Health the authority to issue orders to address health hazards, including ordering the destruction or seizure of a food source.

The role of the public health system is to protect public health, while the role of the CFIA is to ensure the safety of the food supply.

Public health officials rely on a wide range of tools and information when making decisions during a foodborne outbreak, including: surveillance investigations, epidemiological information and laboratory testing. The public health system is structured to err on the side of caution in order to protect the public. A local medical officer of health is authorized to act when he or she has "reasonable and probable" grounds to believe that a health hazard exists (e.g., that a food source is contaminated and has caused illness) and to take steps authorized by the *Health Protection and Promotion Act*, including ordering the destruction or seizure of the food source.

Before issuing a food recall, CFIA looks for evidence to identify the source of contamination in a food product. One of its main goals is to determine whether the source is in the plant and related to a production problem or outside the plant.

In the case of the listeriosis outbreak, positive test results from opened packages of meat were enough to trigger public health units and the Chief Medical Officer of Health to require long-term care homes to hold the product, while CFIA needed positive test results from unopened packages of meat to confirm that the source of the contamination was in the plant and to support a wider product recall.

A Brief Chronology of the Outbreak

Detecting and managing a foodborne outbreak is a complex process that includes identifying initial cases, conducting an investigation to find links and possible sources, using laboratory testing to confirm cases and support the investigation, and implementing strategies to manage the outbreak and protect the public. The following brief chronology illustrates the steps that were taken during the 2008 listeriosis outbreak and the timing of those steps. (For the more detailed chronology of events, refer to the ministry's website.)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
June-July	The Public Health Division of the Ministry of Health and Long-Term Care detects small increases in reported cases of listeriosis through the Early Aberration Reporting System (EARS), a program used to analyze routine surveillance data from the integrated Public Health Information System (iPHIS). Public Health Division investigates but cannot identify a pattern or link among the cases based on reported information.			
July 16	Toronto Public Health begins investigating 2 cases of listeriosis in the same long-term care home.			
July 21	Public Health Division is notified by the Ministry of Health and Long-Term Care's Service Area Office of the 2 cases of listeriosis in the Toronto long-term care home.	Toronto Public Health sends 11 opened food samples from the long-term care home to Ontario Central Public Health Lab for testing.		
July 22	Public Health Division follows up with Toronto Public Health on 2 listeriosis cases: one case is thought to be due to eating sausage received from a friend – only identified link is living in the same long-term care home. Public Health Division analyzes data on listeriosis cases across	Ontario Central Public Health Laboratory receives the 11 specimens late in the day.		

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
July 22 (cont'd)	Ontario reported through the integrated Public Health Information System (iPHIS) but finds no data linking cases to long-term care homes or other institutions.			
July 23		Ontario Central Public Health Laboratory forwards the 11 specimens to Health Canada *Listeria* Reference Laboratory.		
July 24		Health Canada *Listeria* Reference Laboratory receives food samples collected from Toronto long-term care home.		
July 25	Public Health Division detects an increase in reported cases of listeriosis through monitoring iPHIS data.			
July 28	Public Health Division reviews all cases of listeriosis reported through iPHIS from January 1 to date, and requests additional data from public health units.	Public Health Division asks Ontario Central Public Health Lab about any increase in isolates submitted for *Listeria* testing. Ontario Central Public Health Laboratory reports six isolates confirmed in July, which is higher than the three isolates submitted in July for the preceding two years.		
July 29	Public Health Division continues to contact public heath units with listeriosis cases for more information.	Public Health Division asks National Microbiology Laboratory to prioritize samples for *Listeria* molecular testing.	Public Health Division notifies OMAFRA and the Public Health Agency of Canada about an increase in listeriosis cases. Public Health Division issues an alert through the Canadian Integrated Outbreak Surveillance Centre (CIOSC) informing Ontario health units, Public Health Agency of Canada, other national agencies, and other provinces/ territories about an increase in listeriosis cases.	

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
July 30	Public Health Division contacts all health units to ensure all relevant cases are included in the investigation. Public Health Division issues an Enhanced Surveillance Directive requesting public health units to: • ensure timely reporting of listeriosis cases through iPHIS (i.e., within one business day) • provide additional information on cases • send *Listeria* isolates to the Central Public Health Laboratory.	Public Health Division asks public health units to ensure private labs forward *Listeria* isolates to the Ontario Central Public Health Laboratory who will submit: • food samples to the *Listeria* Reference Laboratory for culture and molecular typing • human samples to the National Microbiology Laboratory for molecular typing National Microbiology Laboratory reports only two of 13 samples submitted before July 21 had similar molecular typing: does not indicate common source outbreak.	Public Health Division holds teleconference with: • 15 health units with cases • Ontario Central Public Health Laboratory • Public Health Agency of Canada • National Microbiology Laboratory • Health Canada • Canadian Food Inspection Agency.	
July 31	Public Health Division: • sends hypothesis-generating questionnaire and food sampling information sheet to health units • instructs health units on consistent approach for collecting food samples for testing Food sampling sheet lists cold cuts as highest priority for sample collection.	Public Health Division asks *Listeria* Reference Laboratory to prioritize testing for food samples from the Toronto long-term care home submitted on July 24.		
Aug 1	As a result of the additional information entered by health units into iPHIS (retrospectively), Public Health Division identifies 16 cases of listeriosis in the month of July: the majority were in elderly people who had been in a long-term care home or hospital.	*Listeria* Reference Lab says common outbreak source cannot be determined from food samples alone; confirmatory patterns in human samples required from the National Microbiology Lab.		
Aug 4		*Listeria* Reference Lab confirms that three food samples from Toronto long-term care home – all opened 1 kg packages of meat cold cuts – are positive for *Listeria*.		

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 5	Public Health Division notifies health units with cases, asking them to investigate potential exposure to the three meat products as well as mushrooms and cheese (products implicated in listeriosis outbreaks in Quebec).		Public Health Division informs heath units with cases and the Public Health Agency of Canada about meat products that tested positive.	
Aug 6	Public Health Division advises health units to investigate other possible sources of *Listeria* as well as those in the Aug 5 notice.			
Aug 11		Ontario Central Public Health Lab reports that two food samples from 1 kg opened packages of meat cold cuts submitted by Halton Region Health Department tested positive for *Listeria*.		
Aug 12		National Microbiology Lab confirms that the molecular typing from human cases in Ontario matches patterns found in samples from Quebec and Newfoundland and Labrador.	Halton Region Health Department issues advisory to local long-term care homes about possible link between increase in listeriosis cases and cold cuts, and asks them not to serve or dispose of cold cuts until the investigation is over.	
Aug 13	CFIA asks Public Health Division to ask public health units to submit unopened packages of cold meats to the CFIA laboratory for analysis; Public Health Division issues a verbal request to health units immediately.	*Listeria* Reference Lab reports that PFGE pattern from opened packages of meat from the Toronto long-term care home match in two human cases – one from Toronto and one from Halton; six other cases have related patterns.	CFIA advises Public Health Division and Public Health Agency of Canada that: • Maple Leaf Foods is the manufacturer of the meat that tested positive for *Listeria* • Meats are produced under the Sure Slice brand • Meats are supplied to long-term care homes and other institutional settings in Ontario and distributed nationally • Maple Leaf Foods notifies select customers, asking them not to use	

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 13 (cont'd)			products with the same product codes as the Toronto samples that tested positive. • CFIA does not consider the results conclusive because the samples were taken from opened packages of meat.	
Aug 14	Reporting and investigation of cases continues for next 6 to 8 weeks.		During a teleconference, Public Health Division informs health units with listeriosis cases that Maple Leaf Foods has been identified as source of positive food samples CFIA advises: • all products affected are large packages used only by institutions, such as long-term care homes, hospitals and restaurants • swabs taken from Maple Leaf lines 8 and 9 at the plant on July 3 had tested positive and company is cooperating with inspectors. Public Health Division advises health units of lab results and status of the investigation. Public Health Division asks health units with listeriosis cases to check all long-term care homes, hospitals and retirement homes that received the products and ask them to put the products on hold. CFIA sends summary of food testing findings at 5:20 p.m.	
Aug 15			Public Heath Agency of Canada sends a CIOSC alert that cases with the same molecular typing patterns have occurred in B.C. and Saskatchewan.	

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 15 (cont'd)			Public Health Division asks ALL health units, to contact all long-term care homes, hospitals and retirement homes, check for products implicated in the outbreak and put them on hold. CFIA advises Public Health Division that Maple Leaf Foods has updated its communications to select customers, advising them that the focus of the investigation is three products packed under the Sure Slice brand name.	
Aug 16		*Listeria* Reference Lab reports that 1 unopened cold meat sample from Maple Leaf Foods has tested positive for *Listeria* by culture but molecular typing results will not be available for 3 to 4 more days.		
Aug 17			Chief Medical Officer of Health alerts all medical officers of health to the hazard and asks that staff ensure the two products covered by the recall are removed from long-term care homes and hospitals. Maple Leaf Foods issues a voluntary recall of two Sure Slice brands sold in 1 kg packages to institutional food preparation firms and to the institutions they serve, including restaurants, long-term care homes, hospitals and possibly (not confirmed) some deli counters.	CFIA posts a health hazard alert on its website about two Sure Slice brands but states that there are no confirmed illnesses associated with consumption of the products.
Aug 18	Public Health Division issues notice to health units to check the effectiveness of the two-product recall and to ensure other products put on hold on Aug 15 remain on hold.			

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 18 (cont'd)	CFIA advises that it may need help from health units to check for suspected products that may have been distributed to local food service establishments CFIA reports that it is monitoring effectiveness of recall at restaurants.			
Aug 19			Chief Medical Officer of Health sends a memo to all medical officers of health with an update on the investigation and recall.	CFIA issues health hazard alert advising public not to serve or eat 23 ready-to-eat deli meats packaged at the Maple Leaf Foods plant.
Aug 20	CFIA: • asks Public Health Division to ask public health units to continue to assist with the recall at long-term care homes, hospitals and other health care facilities • takes responsibility for checks at retail stores and distributors. Public health units continue to monitor recall in long-term care homes, hospitals, other health care facilities, and in restaurants and delis as part of their regular food safety inspections.		Chief Medical Officer of Health sends memo to health units advising them of the recall and informing them that the implicated products have been distributed mainly to institutions such as long-term care homes, hospitals and restaurants but may also have been distributed to retail stores and deli counters.	Chief Medical Officer of Health issues a public news release: • advising of a listeriosis outbreak in Ontario • directing the public to the CFIA website for a list of affected products • advising the public – especially people at risk (i.e., elderly, frail, immuno-compromised, pregnant women) to avoid consuming the affected products. Maple Leaf Foods expands its voluntary recall to include 23 packaged meat products produced at the plant and announces it has temporarily closed the plant.
Aug 21		CFIA receives lab results from *Listeria* Reference Lab that 18 unopened Sure Slice food samples from Ontario tested positive – all are on Maple Leaf Foods' voluntary recall list.		Chief Medical Officer of Health: • holds press conference to update the media • notifies Local Health Integration Networks (LHINs) asking them to inform long-term care homes and hospitals about the outbreak and to ensure products on the CFIA list are identified and thrown out.

A Brief Chronology of the Outbreak: (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 22	CFIA: • asks public health units to check recalls at Mr. Sub locations • indicates all other establishments are under its jurisdiction.		Public Health Division posts epidemiological update to Public Health Ontario Portal. Chief Medical Officer of Health sends key timelines to public health units to support coordinated messaging.	CFIA issues alert for a brand of sandwiches made with recalled meats, sold at 7 locations in Toronto.
Aug 23		CFIA and Public Health Agency of Canada receive results from *Listeria* Reference Lab.		Public Health Agency of Canada issues news release, informing public of the link between the listeriosis outbreak and certain items on the recall list. Maple Leaf Foods announces an extended recall at 9:30 p.m. of all products made in the plant.
Aug 24	CFIA asks Public Health Division to request more assistance from public health units in checking recalls at health care facilities, day care centres and Mr. Sub, Tim Hortons, Boston Pizza and McDonald's restaurants.			CFIA: • issues expanded health alert to include other products from the plant • indicates lab results have established a link between recalled meat products and the outbreak. List of >200 products covered by the extended recall is released.
Aug 25				CFIA continues to issue health hazard alerts for specific products.
Aug 27			Toronto Public Health asks CFIA for permission to send a Toronto health inspector as part of the CFIA audit team at the Maple Leaf Foods plant.	
Aug 28			Chief Medical Officer of Health asks OAHPP to prepare clinical practice guidelines for front-line physicians.	

A Brief Chronology of the Outbreak (cont'd)

Date	Detecting and Managing the Outbreak	Confirming the Outbreak: Laboratory Testing	Communicating Among Partners	Communicating with Public
Aug 29				OAHPP posts clinical practice guidelines on its website and MOHLTC distributes guidelines to physicians by fax and posts them on its website.
Sept 2	Toronto Public Health inspector makes first visit to Maple Leaf Foods plant.			
Sept 5				CFIA issues advisory to all federally registered establishments that manufacture ready-to-eat meats asking that they: • disassemble and perform a systematic and thorough aggressive cleaning and sanitation procedure upon meat slicing equipment • perform *Listeria* environmental sampling of contact surfaces • review standard cleaning and sanitation procedures to ensure that working parts are being suitably cleaned and disinfected on an ongoing basis.
Sept 6				Maple Leaf Foods indicates that the most likely source of *Listeria* was contamination in the slicing machines.
Sept 17				Maple Leaf Foods announces that it plans to reopen the plant.
Nov 14	Public Health Division discontinues Enhanced Surveillance Directive.			
Dec 8				Chief Medical Officer of Health declares outbreak over.

Findings and Recommendations

1. Detecting the Outbreak

iPHIS helped detect the outbreak

In 2005 (post-SARS), Ontario implemented the integrated Public Health Information System (iPHIS), a web-based system that all public health units use for reportable infectious disease surveillance and case and contact management. Each health unit is legally responsible for entering case information on all reportable diseases in its jurisdiction into iPHIS. Staff in the Public Health Division analyze data from iPHIS daily supported by a program called Early Aberration Reporting System (EARS), which detects statistical increases in the number of cases above the norm.

The iPHIS and EARS systems aided in the detection of the province-wide listeriosis outbreak. The EARS flags alerted staff to a higher number of cases than usual. As a result, staff were quick to consider the possibility of a wider outbreak. Without iPHIS, the small number of initial cases across the province might never have been linked together and the outbreak might not have been detected until many more people had fallen ill.

As the Infectious Diseases Branch has gained experience working with EARS, it has refined its process for investigating and responding to EARS flags. However, more can still be done to assess the sensitivity and specificity of EARS in detecting outbreaks, and to ensure that public health units have the capacity to respond to EARS flags.

Timely and complete reporting through iPHIS is crucial

Although the iPHIS system works well, there is sometimes a lag between the time a public health unit is aware of a case and the time that data on the case are entered into iPHIS – usually due to priorities within the health units. In some cases, health units do not initially enter enough information (e.g., the fact that a case is in a long-term care home) for ministry staff to be able to identify possible links.

During the investigation, the Public Health Division issued an Enhanced Surveillance Directive, reminding health units to enter listeriosis cases within one business day of receiving the initial notification from a health care facility or laboratory, and to provide more information about each case. As a result of that directive, Public Health Division was able to identify that a larger number of cases than originally suspected had occurred in July. The information on these cases helped identify the outbreak and guide the investigation.

Timely and complete reporting is crucial to detect outbreaks. The system would be more efficient if all health units routinely entered cases quickly and provided complete surveillance data.

Recommendations

Recent changes to Ontario's surveillance system, such as the introduction of electronic case management systems like iPHIS, have significantly enhanced Ontario's ability to detect non-localized foodborne outbreaks.

To continue to build the province's capacity to detect future province-wide outbreaks:

1.1 Local public health units should:

- enter cases of high risk disease, such as listeriosis, into iPHIS in a timely way (i.e., within one business day)
- provide adequate case information to support provincial analysis and investigation.

1.2 The MOHLTC should ensure that Public Health Division and local health units have the skilled staff and other resources to provide timely data, and investigate and respond to any aberrations identified in surveillance data in iPHIS and other electronic systems.

1.3 The MOHLTC should review the sensitivity and specificity of EARS flags and develop an algorithm that defines the steps to assess the follow-up action to be taken in response to EARS flags.

2. Confirming the Outbreak

Given the non-specific symptoms of listeriosis and the relatively small number of people who fall ill from listeriosis, laboratory testing is essential to help identify and confirm a province-wide outbreak.

Molecular typing was critical to confirm the outbreak and find the source

Molecular typing was critical to investigating the 2008 listeriosis outbreak. It allowed investigators to compare isolates from both human and food samples, and identify the probable source of the outbreak. It helped identify a common cluster of cases, whether a particular case was related to the defined cluster, and the links between cases of listeriosis and contaminated foods.

The molecular typing provided by the National Microbiology Laboratory for human samples and by the *Listeria* Reference Laboratory for food samples helped confirm that the cases across the country were linked, and that the source of the contamination was the luncheon meats from the Maple Leaf Foods plant.

Pulsed-Field Gel Electrophoresis, the type of test used in Canada for molecular typing, is only one of a number of methods available. It is a complex test that is complicated to interpret. During the 2008 listeriosis outbreak, the test was able to help identify common patterns, but Ontario will need more experience working with these technologies to link cases across health unit boundaries to understand how to use them effectively and apply their findings when investigating listeriosis and other outbreaks.

Limited capacity for molecular typing affected the investigation

Because listeriosis outbreaks have been so rare in Canada, *Listeria* testing expertise has been centralized at two federal laboratories: the National Microbiology Laboratory in Winnipeg and the National *Listeria* Reference Laboratory in Ottawa. During the 2008 listeriosis outbreak investigation, all molecular typing was conducted by the two federal laboratories, which were responsible for responding to requests from across the country. This reliance on a single laboratory for all molecular typing may no longer be sufficient as typing becomes more integrated into the testing menu.

Toronto Public Health submitted meat samples taken from prepared sandwiches from the long-term care home to the Ontario Central Public Health Laboratory for testing on July 21. They were received late on July 22nd, sent to the Health Canada *Listeria* Reference Lab on July 23, and received there on July 24. The molecular typing results for food samples were not available until August 4. It took two weeks from the time Toronto Public Health submitted the samples to complete the testing process, which is consistent with the time it typically takes for these testing protocols.

It also takes time to fingerprint human samples. The Ontario Central Public Health Laboratory was submitting confirmed cultures to the National Microbiological Laboratory as they occurred, but did not receive confirmation that the patterns of the bacteria in several of its cases matched those in other provinces as well as the pattern found in the opened meat samples until August 12.

At the beginning of the 2008 outbreak, molecular typing of *Listeria monocytogenes* was not available at the Ontario Central Public Health Laboratory, but it was subsequently introduced. If the Ontario Central Public Health Laboratory had conducted the molecular typing in its own laboratory, the time required to transport the samples and request the tests could have been eliminated, and the time it took to obtain test results might have been reduced by, at most, two to three days. Testing process and protocols will still take time (i.e., about 12 days) and the Central Public Health Laboratory will still have had to send its molecular typing results to the National Microbiology Laboratory for cross referencing with molecular typing results from other provinces. However, consideration should be given by the federal government to the

need for greater regional capacity as molecular typing moves from a research tool into more standardized usage. Further, reliance on a single laboratory for advanced testing may compromise time frames for testing in some areas of the country.

At the time of the outbreak, Ontario's public health laboratories did not have a fully integrated laboratory information system. Ontario would be able to respond more quickly to outbreaks if it had an information system that could integrate public health surveillance data and laboratory testing data.

Recommendations

Laboratory investigations will play an increasingly important role in detecting and sourcing non-localized foodborne outbreaks. It will be important to clearly establish the testing protocols, levels of evidence and laboratory capacity and systems required to investigate a foodborne oubreak.

In December 2008, the newly created Ontario Agency for Health Protection and Promotion assumed responsibility for the operation of the province's public health laboratories, and is now developing an integrated laboratory-based surveillance system that will provide timely collection, analysis and communication of laboratory data for all public health partners during outbreaks.

To address gaps identified during the 2008 listeriosis outbreak and enhance Ontario's capacity to investigate and confirm outbreaks:

2.1 The OAHPP should ensure that partners are aware of the requirements for specimen collection and submission, which will lead to more timely processing of tests and communication of laboratory data to all outbreak partners.

2.2 OAHPP should ensure that Ontario has 24/7 capacity within its own laboratory system to conduct the tests required to detect and respond to foodborne outbreaks, thereby reducing its reliance on federal agencies. Predetermined testing protocols should be established for outbreaks that require federal agency lab support.

2.3 OAHPP should develop a coordinated system to monitor strains of bacteria and other organisms identified as public health priorities in human, food and environmental samples, including maintaining a database of strain patterns that can assist in investigating future outbreaks.

2.4 OAHPP should establish a working group (including representatives from federal partners) to:
- identify any potential to improve testing timelines in the province
- develop a plan to enhance Ontario's laboratory capacity and reduce its dependence on federal agencies
- define laboratory roles and responsibilities for sample testing during foodborne outbreaks
- report back to the Chief Medical Officer of Health with recommendations.

2.5 Federal government should:
- Review the existing strategic approach to advanced molecular testing, addressing such items as the acceptable turnaround time for lab results (including transportation), the ability to address anticipated higher demand for molecular testing, and the importance of having appropriate alternatives should the National Microbiology Laboratory not be available.

3. Managing the Outbreak

Differing requirements for laboratory evidence affected the response

As early as July 31, before any test results were available, Public Health Division sent health units a food sampling sheet that listed meat cold cuts as the highest priority for sample collection.

On August 5th, based on the first positive test results from opened packages of cold meats from one site (Toronto), Public Health Division asked health units with cases to investigate possible links with cold meats.

- On August 12, the medical officer of health in Halton Region issued an advisory to long-term care homes in the region, telling them about a possible link between the increase in listeriosis cases and cold cuts, and asking them not to serve these products until the investigation was over.

- By August 13, when PFGE patterns from opened packages of cold meats were found to match those of human cases, Ontario public health authorities felt they had "reasonable and probable" grounds to suspect that the source was the large, institution-size packages of cold meats distributed to long-term care homes, hospitals and other institutions, and to issue a notice asking those institutions to hold those products until the investigation was complete.

  On August 13, Maple Leaf Foods advised its customers not to use meats with three particular product codes.

- On August 14, when CFIA reported positive swabs from two lines at the Maple Leaf Foods plant, the Chief Medical Officer of Health issued a notice to health units with listeriosis cases, telling them that Maple Leaf Foods had been identified as the source of positive food samples and asking them to advise all long-term care homes, hospitals and retirement homes that had received the products to put them on hold.

- On August 15, the Chief Medical Officer of Health issued a notice to ALL health units, asking them to contact all long-term care homes, hospitals and retirement homes, check for products implicated in the outbreak and put them on hold.

However, because the contaminated samples were taken from opened packages of meat, the CFIA did not consider the results conclusive and did not issue a health hazard alert or recall at that time. On August 17, the CFIA posted a health hazard alert about two products that had been distributed nationally – mainly to restaurants, hospitals and nursing homes, and possibly to some deli counters. The alert stated that there had been no confirmed illnesses associated with the consumption of these products.

On August 19, the CFIA issued another health hazard alert warning the public not to eat 23 ready-to-eat deli meat products from a manufacturing plant in Toronto. On August 20, Maple Leaf Foods issued a voluntary recall of 23 products.

On August 20, the Chief Medical Officer of Health in Ontario issued a general health advisory, telling the public of a listeriosis outbreak in the province, directing them to the CFIA website for a list of affected products, and advising people – especially those who were particularly vulnerable to listeriosis (e.g., elderly people, people who are immuno-compromised) – to avoid eating the affected products.

It was not until August 21 – after Maple Leaf Foods had already issued a voluntary recall of 23 products and the Chief Medical Officer of Health had issued the advisory about the listeriosis outbreak – that the CFIA received laboratory test results confirming the PFGE pattern of *Listeria* in unopened packages of meat. Between August 22 and September 5, CFIA issued a series of health hazard alerts related to specific Maple Leaf products sold through various fast-food and retail outlets.

Jurisdictional issues limited effective communication and action

Information is the most important asset during an outbreak investigation. During the investigation the CFIA – the lead federal agency for food recalls – was the sole intermediary between Maple Leaf Foods and the public health officials responsible for investigating the outbreak. Toronto public health inspectors were not initially involved in the investigation in the plant and, when they did seek to gain access, they were told they had to make a special request to be part of the audit team. They were not able to enter the plant until almost three weeks after CFIA first identified Maple Leaf Foods as the manufacturer of the food that tested positive for *Listeria*. These types of restrictions make it difficult for public health authorities to do their job.

Although the Ministry of Health and Long-Term Care asked the CFIA for comprehensive information on the distribution of the products implicated in the outbreak, this information was never received. As a result, it was not until August 14th that public health officials were informed that contaminated products might have been distributed to restaurants and

August 17th that they were informed that contaminated products might have been distributed to some retail stores and deli counters. During the investigation, they were not able to obtain complete information on the number or location of establishments in Ontario that had received products implicated in the outbreak. If public health authorities had had timely access to this information, they might have been able to take additional targeted steps to reduce possible exposure among the general public. The lack of information about the national distribution of affected products also hampered the national investigation of the outbreak.

The product recall process was not well organized

No mandatory food recall was issued by CFIA; however, Maple Leaf Foods issued a voluntary recall that started with two products and expanded to over 220 products made in the same plant.

Over a period of about two weeks after the outbreak was declared, the CFIA health hazard alerts expanded in scope (number of products) and extent (number of retail sites). Each day, new products were announced as posing a risk. The ever-expanding list of products and stores affected created the impression that the response was not well organized, and contributed to the public's sense of unease and confusion. It also made it more difficult for public health units to plan and organize their efforts to monitor the effectiveness of product recalls.

The handling of the food recalls highlighted the management and coordination challenges of an outbreak that involves federal, provincial and local partners, particularly when roles and responsibilities are not clear.

Outbreak management and decision-making processes and structures have not kept pace with changes in food manufacturing processes

Given large-scale manufacturing and processing of food and complex food distribution networks, Ontario and Canada are likely to see more non-localized outbreaks of foodborne illnesses. The current processes and structures for investigating and managing outbreaks are not adequate to support a coordinated response among different jurisdictions and levels of government. Roles and responsibilities at the federal, provincial and local levels are not clear.

Although frameworks have been developed to guide interjurisdictional collaboration – such as the Canada Foodborne Illness Outbreak Response Protocol (FIORP), the Ontario Foodborne Health Hazard and Illness Outbreak Investigations Memorandum of Understanding (Ontario MOU) and the Food Premises Plant Investigation: Multi-Agency Roles document – these frameworks have not been formally adopted and were not fully used during the 2008 listeriosis outbreak. The protocols within existing provincial emergency response plans were also not fully utilized during the outbreak.

As a result, it was not clear to the partners which responsibilities rested with the Public Health Agency of Canada and the federal Chief Public Health Officer, and which ones with the Chief Medical Officer of Health in Ontario. It was also not clear whether the lead federal agency was PHAC or the CFIA, or to what extent local medical officers of health or the Chief Medical Officer of Health in Ontario could act alone to protect public health.

The existing public health system worked well to manage the outbreak in long-term care homes

Ontario's existing system of public health units and those units' close working relationships with long-term care homes and hospitals were strengths in managing the outbreak within the health sector. As early as July 31st, health units received a food sampling sheet that listed cold cuts as the highest priority for sample collection. On August 5th, health units were informed that meat samples from one site had tested positive for *Listeria* through culture testing. On August 14th and 15th, they received information about the specific products that (based on molecular typing) long-term care homes and hospitals should put on hold.

Under the Ontario Public Health Standards, published under section 7 of the *Health Protection and Promotion Act*, local health units are responsible for responding to requests to assist with food recalls. Each health unit has a Food Recall Coordinator responsible for coordinating and managing food recalls locally. The health unit response to all notices and recall requests was good. In the future, it is possible to improve the response by enhancing health units' capacity to receive and respond to communications that come after hours and on weekends.

The local medical officers of health and the Chief Medical Officer of Health have the statutory powers, under certain circumstances, to take action to address risks to health in their health units and in the province. In a localized foodborne outbreak, the roles and responsibilities of public health authorities and other partners are clear and protocols are in place. The roles and triggers for using statutory powers become less clear in a provincial outbreak or a national outbreak that involves federal partners – particularly when the decision to investigate is based on laboratory surveillance. Tension can arise between a jurisdiction's responsibility to act to protect public health and the responsibility of all the jurisdictions involved to develop a coordinated consistent response.

To ensure that all jurisdictions in Canada are able to respond quickly and effectively in all outbreak situations, it is important to clarify all partners' roles and responsibilities, and identify the criteria/triggers for action in all cross-jurisdictional foodborne outbreaks.

To enhance the capacity of all provinces and territories to manage provincial/territorial foodborne outbreaks:

3.1 In the event of a suspected or declared provincial/territorial outbreak, the provincial/territorial Chief Medical Officer of Health should establish and chair a provincial/territorial Outbreak Coordinating Committee (OCC) to provide him/her information and advice in managing the outbreak. The terms of reference of the OCC should explicitly require:

- a mandate to protect public health as the overarching priority
- the participation of all lead provincial and federal food inspection, regulation and public health agencies, including laboratories
- all agencies within the province/territory to fall under the leadership of OCC
- open disclosure of all data and information from all participating agencies
- the provincial/territorial Chief Medical Officer of Health to be the spokesperson for the OCC
- the operation of the OCC to be consistent and, when required, integrated with existing provincial/territorial emergency response plans, the revised FIORP and other provincial/territorial outbreak response plans.

To enhance the capacity to manage a national or international foodborne outbreak:

3.2 In the event of a suspected or declared national/international outbreak, the federal Chief Public Health Officer should establish and chair a National Outbreak Coordinating Committee (NOCC). The terms of reference of the NOCC should explicitly require:

- a mandate to protect public health as the overarching priority
- the participation of the Chairs of the provincial OCCs and the leads of federal food regulation, inspection and public health agencies, including laboratories
- the federal Chief Public Health Officer to be the spokesperson of the NOCC
- the existence of the NOCC to not compromise the mandate, role and primacy of the provincial/territorial OCCs in outbreak management.

To enhance Ontario's capacity to manage provincial outbreaks:

3.3 Both the Canada Foodborne Illness Outbreak Response Protocol (FIORP) and the Ontario Foodborne Health Hazard and Illness Outbreak Investigations Memorandum of Understanding (Ontario MOU) should be reviewed at the provincial and federal levels to make certain the documents take into account large-scale manufacturing practices and that the protocols and processes set out clear roles and responsibilities, ensuring a timely, effective and coordinated response to a foodborne outbreak. They should then be put into operation.

3.4 The Chief Medical Officer of Health for Ontario should develop Ontario-specific guidelines for the management of foodborne outbreaks and provincially initiated food recalls, food seizures, and other activities that may be required under the HPPA. The guidance document should:

- reinforce Ontario's statutory authority to manage a provincial outbreak and protect public health even if that means acting independently from other provincial and federal partners (i.e., when the evidence that public health requires to act may not meet the CFIA criteria to issue a food recall)

- use the protocols within existing Ministry of Health and Long-Term Care and Public Health Division emergency response plans as the basis for outbreak management guidelines
- set out the criteria to change a local outbreak to a provincially managed outbreak
- establish a framework and structure for managing a provincial outbreak that is consistent with existing provincial protocols and agreements with local heath units
- identify the criteria/triggers that will be used to:
  - issue orders to address health hazards related to foodborne outbreaks
  - declare a possible or probable provincial outbreak
  - encourage a federal or industry-led food recall
  - implement a public communications plan.
- provide guidelines for investigating listeriosis and other reportable foodborne illnesses, including sampling protocols and methodologies to be used during provincial outbreaks
- include guidelines on issuing and enforcing orders for holding, disposing of or returning suspect food items to a plant and processes to monitor the effectiveness of a food recall
- establish requirements for regularly reviewing and updating the guidance documents.

3.5 The Chief Medical Officer of Health for Ontario should encourage training and tabletop exercises for all partners to test the protocols and processes for managing a cross-jurisdictional outbreak.

3.6 All public health units in Ontario should maintain 24/7 capacity to monitor outbreak communications, including food recall notices, and develop on-call systems that ensure any notices received after hours are read within two hours of being issued.

4. Communications

The lack of effective communication among the partners created a sense of lack of coordination.

At the provincial and local level, a more disciplined way of sharing information and requesting advice (i.e., other than teleconferences) would help ensure greater clarity, better use of time, and a common understanding of the agreed-upon next steps.

Messages to the public were not coordinated

During the outbreak, each organization and each level of government handled public communications within their respective jurisdictions. Public health units provided information to their local media. The Ministry of Health and Long-Term Care managed communications to the media and the general public in Ontario. The Public Health Agency of Canada and the CFIA were responsible for communications at the national level. Communications were not well coordinated among these different levels of government. For example, the Chief Medical Officer of Health in Ontario issued a press release to the public announcing a listeriosis outbreak on August 20, while the Public Health Agency of Canada did not issue its health alert announcing a link between the listeriosis outbreak and certain food items on the CFIA recall list until August 23.

There was no clear public spokesperson for the outbreak/recall. Once Maple Leaf Foods announced a voluntary recall of its products, the media tended to turn to the company for information. In Ontario's view, it would have been more appropriate to have a government spokesperson take the lead in communicating with the media and the public. Having a government spokesperson would help ensure appropriate public health messages are communicated to the public.

The lack of coordination contributed to public confusion and created the impression that the outbreak was not being well managed, which affected public trust and confidence in the public health system.

The lack of coordination was due in part to the different levels of evidence required by different partners to trigger action, but it was also due to the fact that the Office of the Chief Public Health Officer at the Public Health Agency

of Canada did not appear to have a clear mandate for leadership in a cross-jurisdictional foodborne outbreak. Canada has not yet implemented a national outbreak management strategy that incorporates all federal agencies and ensures coordination with provincial ministries.

In addition to lack of provincial/federal coordination, there was some lack of coordination in provincial communications and messaging. These delays were mainly due to the challenges of communicating complex epidemiological information in a clear, understandable way to the media and the public.

Recommendations

Communications among public health partners and different levels of government as well as effective communication with health care practitioners and the public are essential when managing a foodborne outbreak. They are particularly important during outbreaks that cross jurisdictions.

To enhance the capacity to communicate during an outbreak:

With outbreak partners

4.1 All organizations involved in managing a foodborne outbreak should adopt the 24-hour information cycle that is an integral part of all Ontario emergency response plans.

Information Cycle in a Public Health Emergency

With practitioners

4.2 Communications to health care practitioners should be timely and efficient to ensure that people are diagnosed and treated quickly and effectively.

With the media and the public

4.3 The federal Chief Medical Officer of Health or designate should be the official media spokesperson for a provincial outbreak, and adhere to the 24-hour information cycle when speaking to the media.

4.4 The federal Chief Public Health Officer or designate should be the official media spokesperson for a national outbreak.

4.5 To improve the accuracy of reporting, the MOHTLC and OAHPP should educate the media about epidemiological and laboratory testing methods used during a foodborne outbreak and how data are interpreted.

4.6 The MOHLTC should develop standard fact sheets that can be adapted and distributed quickly in the event of a foodborne outbreak. Communication staff should be involved early in the outbreak response so any communications issues can be resolved quickly and the MOHTLC should establish a streamlined approval process for communications during an outbreak.

Conclusions

Provincial foodborne outbreaks – particularly those where there are no significant local clusters of cases – are more complex to investigate than localized outbreaks. They require different epidemiological and food source identification strategies. They rely more heavily on complex new laboratory testing technologies. They also involve more partners and more communications. Given the increase in large-scale food processing, provincial and national foodborne outbreaks are likely to become more common.

Based on the analysis of the response to the 2008 listeriosis outbreak, the Chief Medical Officer of Health recommends four key steps to strengthen Ontario's – and Canada's -- capacity to respond to provincial and cross-jurisdictional foodborne outbreaks.

1. Clarify Roles and Responsibilities in Outbreak Management

Ontario and Canada need different structures and processes to manage the highly complex task of investigating and managing provincial and national foodborne illnesses and outbreaks. To make the best decisions to protect public health, each partner's role and responsibilities must be clear, information must be shared in a timely way and activities must be coordinated.

Public health should take the lead in outbreak management, and be the public spokesperson. In the event of a suspected or declared provincial/territorial outbreak, the provincial/territorial Chief Medical Officer of Health should establish an Outbreak Coordinating Committee to provide him/her information and advice in managing the outbreak. In the event of a suspected or declared national/international outbreak, the federal Chief Public Health Officer should establish a National Outbreak Coordinating Committee (NOCC), which would include all provincial/territorial Chief Medical Officers of Health.

Protocols and guidelines must take into account the potential impact of large-scale manufacturing practices on outbreak management. All federal and provincial outbreak protocols and memoranda of understanding should be reviewed, updated and put into operation. To ensure a consistent approach across the province, Ontario should develop guidelines for the management of foodborne outbreaks and provincially initiated food recalls, food seizures, and other activities that may be required under the HPPA. All public health units in the province should have a clear understanding of their authority during an outbreak, how to investigate foodborne illnesses, the criteria and triggers that Ontario will use to issue orders, declare an outbreak and encourage a food recall, and how to monitor the effectiveness of a food recall.

Public health must also maintain the capacity to respond quickly. All partners should participate in training and tabletop exercises to test readiness and protocols; and all public health units in Ontario should be able to monitor outbreak communications 24 hours a day, seven days a week.

2. Strengthen Laboratory Capacity

Laboratory testing plays a key role in detecting and confirming non-localized foodborne outbreaks. During the 2008 listeriosis outbreak, Ontario was highly dependent on federal agencies for laboratory testing. The newly created Ontario Agency for Health Protection and Promotion is developing an integrated laboratory-based surveillance system, which will significantly improve Ontario's ability to collect, analyze and communicate laboratory data during outbreaks.

In addition, the OAHPP should develop a plan to increase the public health laboratories' capacity to conduct a wider range of tests, monitor strains of bacteria and other organisms that pose a threat to public health, and educate public health units about sampling techniques. Because time matters during an outbreak, the OAHPP should also assess the potential to improve testing timelines.

3. Enhance Ontario's Capacity to Detect Foodborne Outbreaks

With recent changes to Ontario's surveillance system, such as the introduction of electronic case management systems like iPHIS, Ontario is now better able to detect non-localized foodborne outbreaks. But more can still be done. For the surveillance system to be effective, public health units must provide timely, complete data, and both Public Health Division and local public health units must have the skilled staff and other resources to investigate any signs of a possible outbreak.

4. Improve Communications

Effective communications are essential in managing a foodborne outbreak and in maintaining public confidence. During cross-jurisdictional outbreaks, partners must work closely together to coordinate communications.

The Chief Medical Officer of Health or designate should be the official media spokesperson during a provincial outbreak. Similarly, the federal Chief Public Health Officer or designate should be the official media spokesperson for a national outbreak. Communications should be timely and clear. To improve the accuracy of reporting, the MOHTLC and OAHPP should educate the media about foodborne illnesses and the science of outbreak detection and management.

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